

Classroom on the Internet using RTMP

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Abstract

Currently, e-learning web sites are used by student individually. Teachers prepare some learning materials including exercises or homework and post them on the web pages. Students will interact directly with the learning materials through completing a sequence of programmed exercises. There are many e-learning web sites that are provided with excellent contents and designs but they generally lack of interactive response and face-to-face communication. Students cannot ask questions and get response immediately. It is just like one way communication for learning. Therefore, it yields student's boring and quit before finish the course. Many students find that their learning is most effective when they actively construct knowledge during group social interaction and collaboration. In this paper, we propose inspire creativity of e-learning called Classroom on the Internet by using RTMP [4]. RTMP (Real-Time Messaging Protocol) is a sophisticated TCP-based real-time networking protocol which supports the efficient exchange of messages, synchronized data, audio, and video. Teacher and students can publish streaming audio, video and other data messages to present streaming media with interaction or navigation. We apply this protocol with remote SharedObjects [4] technique which allows multiple connected users to share data and user interfaces in real time, coupled with client and server data storage capabilities. Using this classroom on the internet, students can immediately interact with teachers as though they are studying in real classroom. We believe that it will be interesting place for teachers and students to join and become the most important feature of e-learning web sites that makes more attractive and complete e-learning system. In the future, it will further be implemented as virtual school or university on the internet.

1. Introduction

Technologies such as streaming video, virtual learning environments and teleported experiments are entering the Web-based learning arena. Along with the development of a second-generation online education infrastructure, it will be necessary to consider changing the interface of education such as reinventing pedagogy for the new interface, including multimedia and hypermedia enhancements, and creating the educational standards necessary for generalized deployment. Instructional learning goals should drive media selection, application, and the course development process. Characteristics of the distance learner and the impact of technology are also important considerations in instructional media selection and course development. The new streaming technologies have made it easier than ever for people to receive a quality education by bringing the classroom to the student. Imagine, a teacher at one university campus delivering a lecture while students in a classroom two cities away watch the same lecture in real time. In a residence hall not far away, a student recovering from an operation watches a lecture recorded from an earlier class she had

missed delivered on-demand right in the comfort of her own room. In a city 5,000 kilometers away, a student is using the on-demand lectures to take part in the same course delivered completely online. With the advent of streaming technology and the possibilities it creates, scenarios like these have been repeated all over the world.

2. Related Work

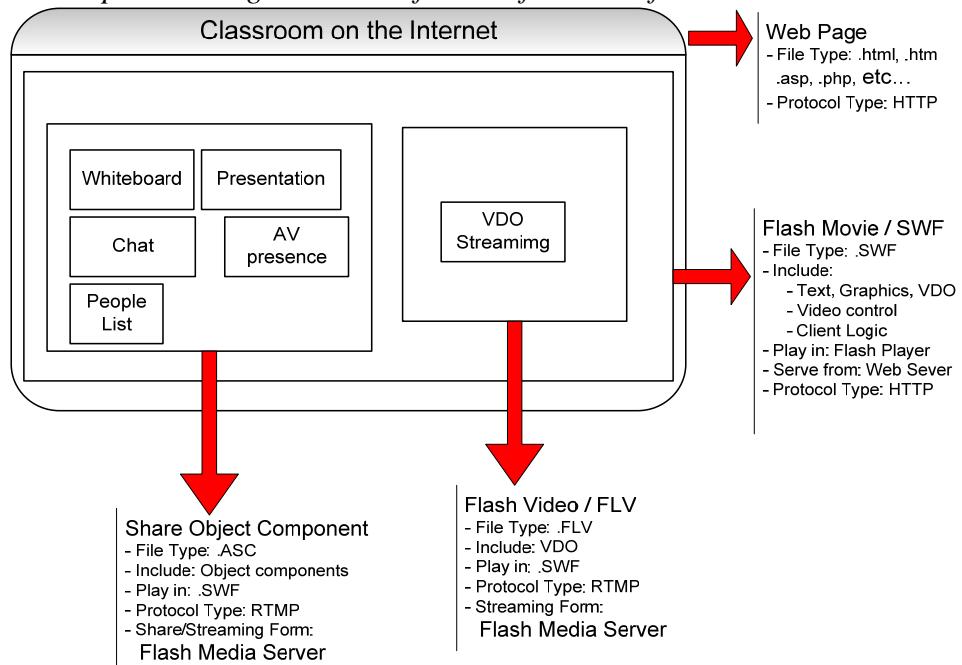
Traditional study such as blackboard is provided a rich interactive between lecturer and learner that cannot easily be replaced with PowerPoint slideshows. ChalkTalk [1] is presented in this year. This system automatically produces e-learning materials from a videotaped chalk talk lecture in front of an ordinary blackboard or whiteboard. But this lack offs the activity. The Learning Activity Management System (LAMS) [2] is provided more student interactive such as question and answer (with student answers shared with the group), asynchronous discussion forum, synchronous chat. The pilot evaluation of LAMS, only 15% of students were willing to discuss ideas in front of their peers in the classroom, but over 80% of the same students were willing to discuss their ideas within LAMS. e-learning is provided self-managed learning that learner should to study when they want, but some group of people still like traditional teaching, where the lecture times were fixed [3]. Therefore, we proposed the additionally feature for e-learning to make virtual classroom were consisted the learner and the lecturer on the internet. This virtual classroom we fix the times to learn but the learner and lecturer can access to the classroom from anywhere that have internet. We proposed two features for the virtual classroom. Firstly, the lecturer teaches by PowerPoint slide. So the learner can should synchronous the slide page with the lecturer or the learner should the slide page by them self that can difference from the lecturer but not over the page that lecturer go to. This feature makes the learner comfortable to learn. Secondly, in a virtual classroom the learner and lecture can have activity with share board. This is the two-way communication that will make more interactive. Nowadays, there are many collaboration and communication programs in the market such as NetMeeting, CollabWorx Virtual Classroom, Breeze, MSN, or Skype. Some programs are free and some are not. Each program has pros and cons. Let's us consider the features offering in each program.

3. Design of Classroom on the Internet

3.1 Functions and protocol classification

There are some requirements that should be taken into consideration as follows: 1) shared object component and 2) VDO streaming part. There are many objects such as white board, presentation, chat, AV presence and people list in classroom on the internet. They are allowed to be shared with other students. Remote shared objects are managed by streaming server. Client can access shared objects and get update whenever a change is made to that shared object. VDO streaming part is also provided on the streaming server. The *Top level design* is shown in Fig. 1.

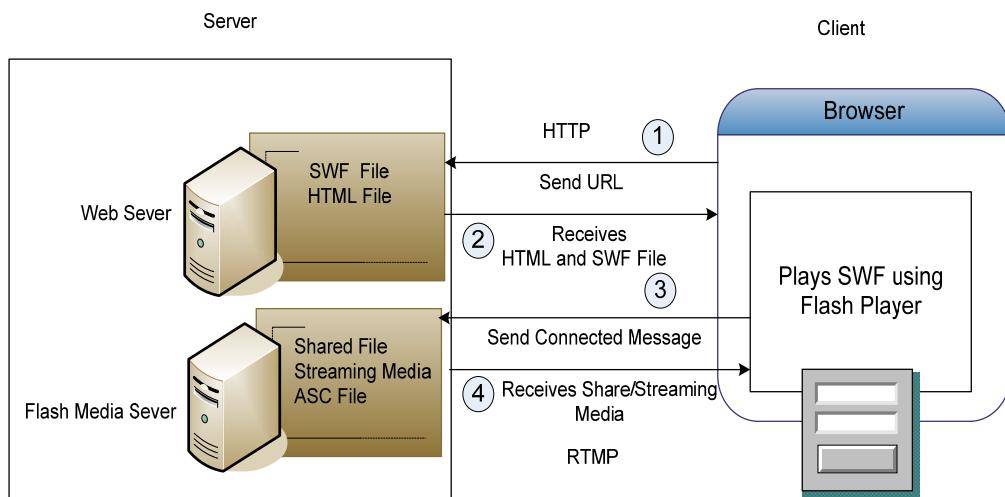
Figure 1 Top level design and classification function of Classroom on the Internet



3.2 Client/Server sequential process

There are four steps in sequential process in order to obtain streaming objects. Firstly, client requests for the HTML and SWF files by using HTTP on TCP connection. Secondly, web server send HTML with embedded links and SWF files back to the client according to their request. Thirdly, client sends message to flash media server by using RTMP protocol. Lastly, shared SLV file and streaming media are sent back to client. The general connecting and displaying share and streaming media is shown in Fig. 2.

Figure 2 Sequence procedural in general connecting and displaying share and streaming media



3.3 Collaborative functions for teacher and student

3.3.1 Login function

When student or teacher wants to enter in the classroom, they must login with correct username and password. In the classroom, they are allowed to use shared objects or resources.

3.3.2 Whiteboard function

The purpose of using this function is to provide a collaborative environment for students and teachers. They can write message in text format and draw line on shared whiteboard environment in real time. When they want a message or line, they must select tools by dragging and dropping them on the whiteboard. They can also delete objects by pressing delete key on the keyboard. Students can write or erase any items at any time they want. They are equally authorized in this classroom.

3.3.3 Presentation function

This function allows creating a presentation in SWF format. This function contains two modes. The first mode is teacher mode. Teacher can fully control the presentation. Students can see the same frame simultaneously. The second mode is student mode. Student can navigate the presentation by using next and back buttons in order to view the presentation. They are not allowed controlling the presentation that the teacher has corresponded. The presentation function requires SWF presentation file.

3.3.4 Chat function

This function supports teacher and students for chatting in regular text format. They can send message to other people in the same classroom. Text can be selected in different styles.

3.3.5 List of students

This function displays teacher and students name that login the classroom. All usernames appear on the list in the classroom that is used to identify who they are.

3.3.6 Audio/Video presentation function

This is very important function for face to face communication. VDO camera and microphone are essentially needed for this function. Teacher and his/her students can send and receive audio and video within the same classroom. If someone is sending audio or video or both, the other people can see and hear as well.

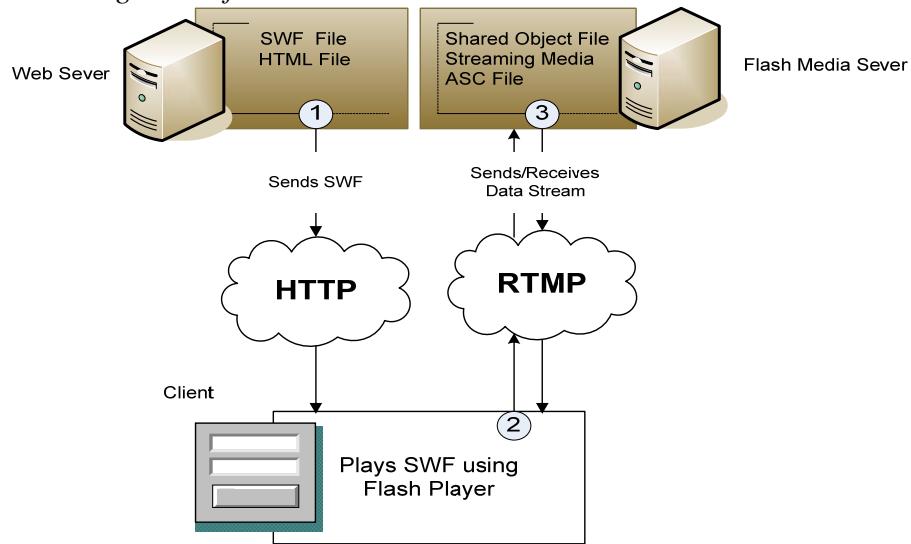
4. Supporting technology

4.1 Flash Media Server architecture overview

The Macromedia Flash Media Server (FMS) platform consists of two parts: the server, which provides the means of communication, and Macromedia Flash Player. Applications consist of a client Macromedia Flash Movie (SWF file) that is run by Flash Player. Server components are share with all clients. The server component consists, minimally, of an application folder that we have created on the server side running Flash Media Server. This folder can optionally contain Server-Side Communication ActionScript (ASC) files and other resource files used by the communication application. The server and the Flash client application communicate over a persistent connection using Real-Time Message Protocol

(RTMP). In a typical scenario, the Flash client is delivered to Flash Player by a web server over HTTP. The Flash client then establishes a persistent connection to Flash Communication Server using RTMP, allowing for an uninterrupted data stream to flow between client and server [4]. The RTMP protocol of communication for Streaming media is shown in Fig. 3.

Figure 3 *flash media server provides a RTMP protocol of communication for Streaming media for client.*



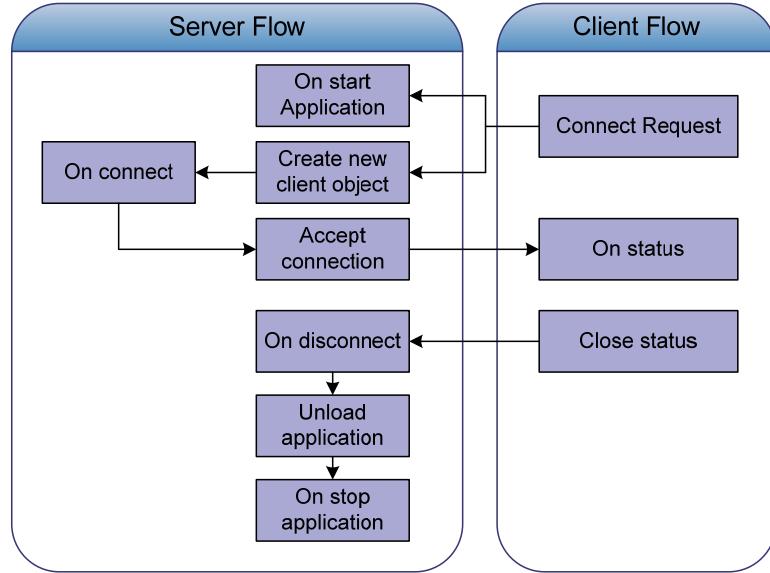
4.2 RTMP

Real-Time Messaging Protocol (RTMP) is a protocol for client-server communication. It is a proprietary protocol developed by Adobe Systems (formerly developed by Macromedia) that is primarily used with Macromedia Flash Media Server to stream audio and video over the internet to the Flash Player client, but can also be used for general remote procedure calls (RPC). RTMP is basically a TCP/IP protocol designed for high-performance transmission of audio, video, and data messages [4].

4.3 Client-Sever connection Flow

When the client connects to the server, the server calls application start method to run. Next, the server-side will make and hold connection. The logic in this method determines whether to accept or reject the connection. Back on the client side, the on status handler is called to report whether the connection was accepted or rejected. When the client closes the connection, the server-side disconnects and closes session [4]. The connection flow between clients with server is shown in Fig. 4.

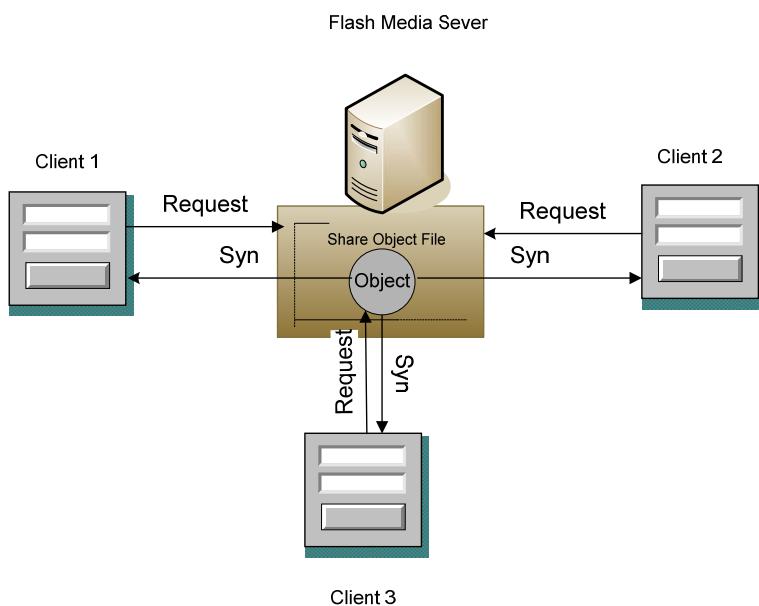
Figure 4 Connection flow between client with server via RTMP protocol



4.4 Shared objects

Remote shared objects are managed by Flash Media Server and provided messaging, data synchronization, and data storage services. Flash clients connect or subscribe to a remote shared object and receive updates whenever a change is made to that shared object. Also, messages can be sent to all clients connected to a remote shared object. A remote shared object can persist across application sessions, or be temporary [4]. The shared object objects provide data storage and synchronization services for clients are shown in fig. 5.

Figure 5 Shared objects provide data storage and synchronization services for clients.



5. The Implementation

We test Classroom on the Internet on Local Area Network (LAN). The client site must contain flash player application in order to display flash movie. Flash media server and IIS must be installed in streaming/web server. The experiment is set up and run on windows platform.

5.1 Login function capture

Figure 7 Show a page of Login function



5.2 Presentation function capture

Figure 8 Show a page of presentation function



5.3 Whiteboard function capture

Figure 9 Show a page of whiteboard function



6. Conclusion

The classroom on the internet can work well according to the defined functions. The classroom on the internet can work as any classroom in the school. With the use of computers and information technologies, the barriers of space and time can be broken down. This classroom is an opportunity for many students in rural area that their homes are far away from school. They will have a chance to study and communicate with teacher and other students. Using this classroom on the internet, we do not imply that it is better than the real classroom in the school but it is a choice in order to move school closer to students who lack of the opportunity. We want classroom on the internet to be one standard feature from several features for e-learning. We believe that it will be an important feature for electronic learning system in the near future.

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